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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/809,451	03/26/2004	Tetsuro Mizushima	119237	7669

25944 7590 02/09/2007  
OLIFF & BERRIDGE, PLC  
P.O. BOX 19928  
ALEXANDRIA, VA 22320

EXAMINER
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VERDERAME, ANNA L

ART UNIT	PAPER NUMBER
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1756

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/09/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

# Office Action Summary

Application No.

10/809,451

Applicant(s)

MIZUSHIMA, TETSURO

Examiner

Anna L. Verderame

Art Unit

1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 3/26/2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date See Continuation Sheet.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :7/19/2005, 11/29/2004, and 7/1/2004.

**DETAILED ACTION**

***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

2. Claims 1-3 and 6 are rejected under 35 U.S.C. 102(e) as being anticipated by Tseng et al. 2004/0219455 <sup>as evidenced by</sup> ~~in view of~~ Hack's Chemical Dictionary.

46  
2/5/07

Tseng et al teaches a SiO<sub>2</sub> film containing gold, silver, and platinum metal particles in an ultra high-density recordable optical data-recording medium. Pictures taken using a transmission electron microscope show the silver particles to have diameters of 3-14.3 nm and having a distance of 2.84 nm between each particle. The gold particles were found to have a diameter of approximately 3.5 nm and a distance of

Art Unit: 1756

about 1.81 nm between each particle. The platinum particles had diameters of approximately 2.0 nm and a distance between the metal particles of approximately 1.0 nm (0044-0047). These results are shown in figure 3 and 4 of this reference.

Hackh's Chemical Dictionary teaches that chalcogenides include the elements oxygen, sulfur, selenium, tellurium, and polonium(p.146 2<sup>nd</sup> column).

3. Claims 1-3 and 5-12 are rejected under 35 U.S.C. 102(b) as being anticipated by Kasai et al. 4,214,249.

In example 2 Kasai et al. an optical recording medium comprising a metal dispersed chalcogenide recording material. Silver was used as a diffusible metal and an Ag layer of about 20 nm was formed on the  $\text{Ge}_2\text{S}_3$  recording film which had been formed on a polyester sheet. A blanket light irradiation was applied to the Ag+ $\text{Ge}_2\text{S}_3$  bi-layer to diffuse the Ag of the diffusible metal layer completely and mutually into the  $\text{Ge}_2\text{S}_3$  layer so that an Ag-Ge-S chalcogenide glass was prepared. An image recording was carried out with respect to the chalcogenide glass recording member by using an argon laser(output 200 mW, wavelength of 488nm)(13/11). In addition, copper was employed as a diffusible metal in place of Ag as mentioned above and vacuum-deposited on the  $\text{Ge}_2\text{S}_3$  film in a similar manner and blanket light irradiation was applied thereto to prepare a Cu-Ge-S chalcogenide glass(13/55-14/26). Chalcogenides listed in the table at (13/45-50) were also used.

Kasai teaches the use of other chalcogens such as As-S, Ge-S, As-S-Ge, Ge-Se, and others. The reactivity of chalcogen elements is similar to each other so that the various chalcogenides obtained by modifying the above exemplified chalcogenides by

Art Unit: 1756

changing the chalcogen elements can be effectively used (5/25-49). It is also effective to incorporate to the non-metallic (chalcogenide) layer, a minor amount of metal as an additive for the purpose of improving light sensitivity and the optical density.

Representative metal additives may be Ag, Cu, Cd, Mn, Ga, In, Bi, Sb, Fe, Ni and alloys thereof. Ag and Cu are most preferable. The amount of the metal additive may be 1-0.0001 atoms per 100 atoms constituting the non-metallic (chalcogenide) layer.

Usually, 0.5-0.005 atoms per 100 atoms are preferable (5/62-6/2).

4. Claims 1, 2, 4, 6-10, and 13-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Slinger et. al. "photodoped chalcogenides as potential infrared holographic media", Applied Optics Vol 31(14) pp.2490-2498 (05/1992).

An amorphous chalcogenide layer is deposited by spin coating on to a substrate. A thin metal film is deposited on top of the chalcogenide. Light of a suitable wavelengths is arranged to form an intensity pattern in the chalcogenide, corresponding to the profile of the desired grating. Initially, the actinic radiation is absorbed at the chalcogenide glass-metal interface. This causes growth of metal-doped regions into the chalcogenide. Subsequently, incoming radiation probably absorbed at the undoped-doped glass boundary, causes further growth of the doped region with a corresponding depletion of the metal reservoir. The silver concentration is uniform throughout the photodoped region. It is important to note that migration of the metal is only along the direction of incoming radiation (page 2491). The chalcogenides used in this paper were arsenic sulfides ( $\text{As}_x\text{S}_{1-x}$ , where  $0 < x < 1$  and  $x$  is usually .4) with silver as the doping metal, although other chalcogenides and metals are known to exhibit the same effect.

The actinic radiation can be anywhere from x rays through beyond visible red wavelengths. The choice depends on the chalcogenide-metal system and the thickness of the chalcogenide film(pp.2491-2492 grating formation). The photodissolution effect in chalcogenides shows promise as one of the few techniques for producing low-loss holographic materials for use at any given wavelength 600 to beyond 1600nm(abstract). Figure 2. shows the transmittance of the doped and undoped  $\text{As}_2\text{S}_3$  film. The short wavelength end of the transmitting region for the chalcogenide glass is around 500 nm. This figure also shows the large difference in transmission between the doped and undoped material. Figure 3. shows the dependence of the refractive index of the doped and undoped films on the wavelength of light.

5. Claims 1, 2, 6-8, and 13-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Inoue et al. 3,825,317.

In example 4 Inoue et al. teaches the use of a chalcogen-metal recording material. The chalcogen glass used was  $\text{As}_4\text{Se}_3\text{Te}_4$  and an layer of Ag was used. The resulting member was used for conducting real time holography as shown in Fig 31 and he state and amount of a small deformation on a body<sup>16</sup> caused by an external force 17 was directly determined. The optical system in figure 31 comprises argon laser 5 (488nm out put 500mW), shutter 18, beam expander 6, plane reflection mirror 19, surface to be measured 20, beam splitter 7, the above mentioned photosensitive member 9, He-Ne laser 21 (632.8nm), primary diffraction light 22, camera for photographing interference pattern 24, interference filter 23,23'(for 632.8nm), primary diffraction light 22', mask 30, and photoelectron multiplier 33. The photoelectron

multiplier 33 is used for measuring the intensity of diffraction light to indicate the regeneration efficiency and the shutter 18 closes when the regeneration efficiency is maximum. Therefore, laser 21 serves as a monitor for giving maximum exposure(18/43-66).

In example 8, Inoue teaches the use of a chalcogen-metal recording material. The chalcogen glass used was  $\text{As}_2\text{Se}_5\text{Ge}_1$  and an alloy of  $\text{Cu}_{39.9}\text{Ag}_{60.1}$  was used. The resulting member was exposed to a hologram pattern while the member was heated by an infrared lamp from the side(20/20-30).

Inoue et al. also teaches the recording and regenerating of a hologram. Recording and regenerating may be simultaneously conducted. In other words, it is possible that a light to which a photosensitive member is sensitive i.e. coherent light having a wavelength corresponding to the spectral sensitivity range of the photosensitive member is projected to record hologram simultaneously with regenerating hologram by using a light of a wavelength outside of the spectral sensitivity range as the reference beam. In this case, the coherent light is preferably argon light (488 nm) and the reference beam(sic) is preferably He-Ne- light 632.8(15/40-60).

The examiner holds that that by using the term "reference beam" the author actually meant to say read-out beam.

### ***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:



Art Unit: 1756

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-3 and 5-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kasai et al. 4,214,249 in view of Slinger et al. "photodoped chalcogenides as potential infrared holographic media", Applied Optics.

To address the embodiments not anticipated or rendered obvious above, it would have been obvious to one of ordinary skill in the art to modify the example of Kasai et al '249 by using a thin Ag and/ or Cu film in place of that used such that the content is between <sup>0</sup>.1 and 2 vol % and/or the particle size is less than 24 nm (1/20  $\lambda$ ) based on the disclosure of 1-0.0001% metal atoms.

WA 3/1/07

8. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kasai et al. 4,214,249 in view of Inoue et al. 3,825,217 and Slinger et. al. "photodoped chalcogenides as potential infrared holographic media", Applied Optics Vol 31(14) pp.2490-2498 (05/1992).

To address the embodiments not anticipated or rendered obvious above, it would have been obvious to one of ordinary skill of the art to form the chalcogenide-metal recording medium of example 2 of Kasai et al. and record holograms in it using a light source(see figure 31) having a wavelength of 488 nm based on example 4 of Inoue et al. in which an Ag-doped As-Se-Ge chalcogenide glass is reproduced using these wavelengths and based on the disclosure in Kasai et al. at (5/25-49) that these

chalcogenide glass materials have similar properties, and to use a 632.8 nm light source having a wavelength within the transmitting region of the chalcogenide glass based on the example of Inoue et al. and with the knowledge found in figure 2 of Slinger et al which shows the low- end of the transmitting region of  $\text{As}_2\text{S}_3$  to be around 500 nm and further in view of the equivalence taught by Kasai et al. at (5/25-49), with the expectation of effectively forming a useful optical recording medium.

9. Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Slinger et. al. "photodoped chalcogenides as potential infrared holographic media", Applied Optics or Kasai et al. 4,214,249 in view of Li et al. 6,890,790.

Li et al. '790 teaches the advantages of co-sputtering metal and chalcogenide glass. Co-sputtering allows for relatively precise and efficient control of a constituent ratio between the doping metal and the chalcogenide glass. Further, it allows for a high degree of uniformity over the depth of the formed layer of chalcogenide glass and metal. Also, metal concentration can be varied in a controlled manner along the film depth(abstract). Doping metals include Ag, Cu, and Zn. Examples of chalcogenide glasses that can be use include  $\text{Ge}_x\text{S}_{1-x}$  and  $\text{As}_x\text{S}_{1-x}$  (2/45-50).

It would have been obvious to one of ordinary skill in the art to modify the examples of Kasai et al. or Slinger et al. by co-sputtering the chalcogenide and the metal with the expectation of obtaining the benefits recited in the abstract of Li et al. 6,890,790.

10. Claims 1-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kasai et al. 4,214,249 in view of Tseng et al. 2004/0219455 and Inoue et al. 3,907,566.

In regards to claim 3 of this application, Kasai records with a laser having a wavelength of 488 nm. The diameter of the silver particles in Tseng et al., 3 and 14.3 nm are 1/162 and 1/34 of the wavelength of said light. The gold particles in Tseng et al. having a diameter of 3.5 are 1/139 of the wavelength of said light. The Pt particles of 2.0 nm in diameter are 1/244 of the wavelength of said light.

In regards to claim 4 the examiner holds that the area between the metal particles is occupied by chalcogenide material. This assumption combined with the information given in Kasai et al. that the amount of the metal additive may be 1-0.0001 atoms per 100 atoms constituting the non-metallic (chalcogenide) layer. Usually, 0.5-0.005 atoms per 100 atoms are preferable.

Considering a silver chalcogenide film with a ratio of 1 silver atom/100 chalcogenide atoms and a silver atom diameter of 3 nm and a chalcogenide diameter of 2.84, the vol % of metal particles is 1.1%.

Considering a gold chalcogenide film with a ratio of 1 gold atom/100 chalcogenide atoms and a gold atom diameter of 3.5 nm and a chalcogenide diameter of 1.81, the vol % of metal particles is 3.3%.

Considering a platinum chalcogenide film with a ratio of 1 platinum atom/100 chalcogenide atoms and a platinum atom diameter of 2.0 nm and a chalcogenide diameter of 1.0, the vol % of metal particles is 4 %.

Also, see claim 5 of this reference.

The examiner holds that the use of a lower concentration of metal atoms that was still in the range recited by Kasai et al. would make the vol% of the gold and platinum atoms less than 2vol% and greater than <sup>0.1</sup> vol%.

not  
25/09

Inoue et al. '566 teaches a chalcogenide-metal glass. Representative chalcogens include As-Se systems, Ge-S systems, S-Si systems, As-Se-Ge systems, As-S-Se systems, and others. The metals include Ag or Cu or alloys containing Ag and/or Cu(5/63-6/15). The composition ratio of the photosensitive particles is selected depending upon the use of the pattern to be formed. In general, 0.01-50 parts by weight of metal is preferably used for 100 parts by weight of the photosensitive particle. Particle size of the photosensitive particles is selected depending upon the resolving power required in each usage of the photosensitive member. In general the particle size preferably ranges from 0.01-20 microns(10-2000 nm).

It would have been obvious to one of ordinary skill in the art to modify the example of Kasai et al by using a chalcogenide metal film having metal particles having diameters similar to those used in Tseng et al. and/or Inoue et al. '566 and with the reasonable expectation of forming a useful recording material. Further, it would have been obvious to use other metals such as Au, Cu, or the like based upon the disclosure of equivalence by Tseng et al.

**Conclusion**

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following references are cumulative to the references relied upon for the rejections.

-Kawaguchi et al. "Optical, electrical, and structural properties of amorphous Ag-Ge-S and Ag-Ge-Se films and comparison of photoinduced and thermally induced phenomena of both systems" J. Appl. Physics 79(112) pp. 9096-9104 15 June 1996-Fig 4. shows change in transmission of chalcogenide glass with addition of metal atoms.

-Kawaguchi et al. "Analysis of change in optical transmission spectra resulting from Ag photodoping of chalcogenide film" Japanese Journal of Applied Physics 26(3) pp.15-21, 3 January 1987. -Fig 2.

-Haltz et al. "Effect of composition on the structure and electrical properties of As-Se-Cu glasses" J. Appl. Phys 54(4). April 1983 pp. 1950-1954. -As-Se-Cu films used in optical memory devices(introduction).

-2003/0064293- Holographic recording mediums using chalcogenide-metal glass.  
(0020,0028,0030,0031,0046)

-Ghrandi et al "Silver photodissolution in amorphous chalcogenide thin films" Thin Solid Films 218 (1992) 259-273-Diffusion of metal particles in chalcogenide films hints at the small particle size.

-Elliot SR. " a unified mechanism for metal photodissolution in amorphous chalcogenide materials" Journal of Non-crystalline Solids 130(1991) 55-97- see

Art Unit: 1756

introduction. See also section entitled photodiffusion process and "Light-intensity dependence of the PD process"

12 Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anna L. Verderame whose telephone number is (571)272-6420. The examiner can normally be reached on M-F 9A-5:30P.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on (571)272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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MARTIN ANGEBRANDT  
PRIMARY EXAMINER  
GROUP 1100 1756